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(71) Applicant: KIMBERLY-CLARK CORPORATION [US/US]; 401 North Lake Street, Neenah, WI 54956 (US).

(72) Inventors: YEO, Richard, Swee-chye; 1349 Holly Bank Circle, Dunwoody, GA 30338 (US). JOHNS, Eric, Mitchell; 215 North Talbot Court, Roswell, GA 30076 (US).

(74) Agents: WILSON, Patrick, C. et al.; Kimberly-Clark Corporation, 401 North Lake Street, Neenah, WI 54956 (US).

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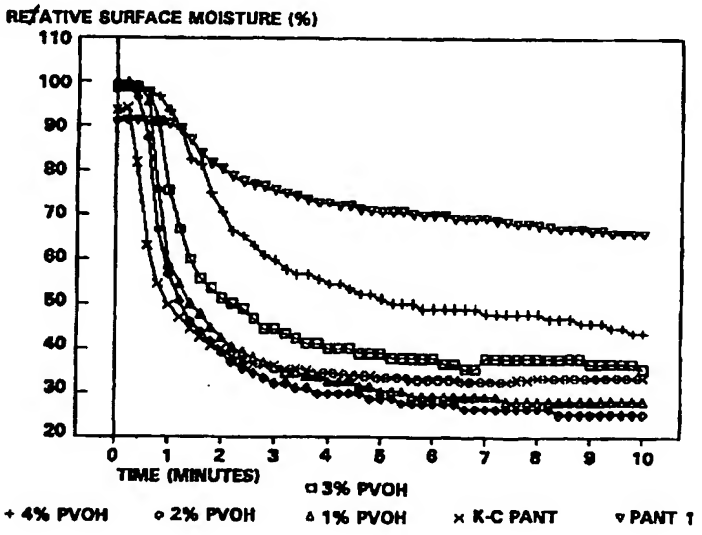

(57) Abstract

Disclosed herein a personal care absorbent article which when first insulted, has a high initial surface moisture value which is maintained for several minutes but then, after a short period of time, drops to a lower value. As a result, the article has an initial "wet" feel but quickly changes to a drier feel so as to provide more comfort. The combination of wet and dry feelings is aided by the use of a polyvinyl alcohol surfactant treatment on the surface of the fibers forming the liner material of the personal care absorbent article. The treatment is present in a weight percent add-on of from about 1 to about 5 percent, based upon the total weight of the liner.

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POLYVINYL ALCOHOL-TREATED LINER FOR PERSONAL CARE ABSORBENT ARTICLES

FIELD OF THE INVENTION

The present invention is directed to liner materials for personal care absorbent articles. More specifically, the present invention is directed to a fibrous nonwoven web liner material with a polyvinyl alcohol treatment to the fibers which has an initial wet feel to indicate to the user that an insult has occurred and then, with a passage of time, the liner material provides a drier and more comfortable feel.

BACKGROUND OF THE INVENTION

A major objective in the development of personal care absorbent articles over the last decade has been the creation of liner materials which provide a clean and dry feel. Most personal care absorbent articles including diapers, training pants, incontinence devices, sanitary napkins, bandages and the like employ a liner or body facing material which is adapted to be placed adjacent to the wearer's skin. Using diapers as an example, originally diapers were very wet to the touch once they had been insulted due to the inability of the diapers to channel fluids away from the wearer's skin to areas in the interior of the diapers where the liquid could be bound up and retained. As diaper and other personal care article designs have advanced, they have been increasingly more effective at channeling fluids away from the wearer's skin and thereby creating a much drier feel. This has resulted in a number of benefits including, but not limited to, skin wellness, especially with diaper rash, and improved comfort to the wearer.

In the area of diapers, one of the most recent advances has been the creation of training pants which are a cross or bridge between diapers and underwear for children. The

purpose of the training pants is to provide a transitional garment during the toilet training stage of a child's development. Fortunately and unfortunately, such articles as training pants have now been so well engineered that the wet sensation associated with the wearing of a wet or soiled article has been greatly reduced. It may be desirable if such devices as diapers, training pants and incontinence garments would initially, upon insult, feel wet or damp so as to alert the wearer and temporarily remind him or her of the fact that an insult has taken place. For a number of reasons, once the insult has taken place, it may not be practical or possible to change the soiled article. As a result, the wearer may have to wear the soiled article for some length of time. Consequently, once the initial signal of an accident has been given to the wearer, it would be desirable if the liner material would then revert to as dry a feeling as was possible so as to provide comfort to the wearer until such time as the article could be changed. There is therefore a need for a personal care absorbent article which has a liner material which will initially provide a "wet" feel to the wearer to indicate that an insult has taken place but which over time will provide the wearer with as dry a feel as is practically possible. The present invention is directed to such a liner material and resultant article.

SUMMARY OF THE INVENTION

The present invention is directed to a personal care absorbent article with a wet liner which upon initial insult has a high relative surface moisture but then, within a short period of time, the relative surface moisture drops to a lower value so that long term the overall article should have a more comfortable feel. The personal care absorbent article includes a liquid permeable bodyside liner, an outercover and an absorbent core disposed between the bodyside liner and the outercover to form the article. The bodyside liner is made from a fibrous nonwoven web wherein the web includes a wetness

indicator treatment which comprises polyvinyl alcohol and a surfactant. It is desirable that the wetness indicator treatment be present on the web in an add-on of from about 1 to about 5 percent by weight based upon the total weight of the web. The resultant article has a relative surface moisture value of 65 percent or greater at approximately 48 seconds after insult and a relative surface moisture value of 45 percent or less at approximately ten minutes. More desirably, the relative surface moisture value at approximately 48 seconds is 90 percent or greater.

In a more refined embodiment, the bodyside liner could comprise a fibrous polyolefin nonwoven web having a basis weight ranging between about 0.5 and about 0.85 ounces per square yard. The outercover could comprise a layer of polyolefin film attached to a layer of fibrous nonwoven web and the absorbent core could contain at least about 20 percent by weight superabsorbent based upon the total weight of the absorbent core. The personal care absorbent article of the present invention has a wide variety of applications including, but not limited to, use in the form of a training pant, diaper or incontinence garment.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a partial cut-away top plan view of a personal care absorbent article, in this case, a training pant according to the present invention.

Figure 2 is a graph showing relative surface moisture values over time for several personal care absorbent articles including the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The present invention is directed to a personal care absorbent article with a wet liner for use as a child toilet training aid. The liner material of the present invention also can be used in other articles and applications where a

material is needed which when first insulted feels wet to the touch but, in a short period of time, again feels dry. Consequently, another use would be as a liner material for other personal care absorbent articles including, but not limited to, diapers and incontinence garments.

Personal care absorbent articles include such items as diapers, training pants, sanitary napkins, incontinence garments, bandages and the like. Referring to Figure 1, the most basic design of all such articles 10 typically includes a bodyside liner 12, an outercover 14, and an absorbent core 16 disposed between the bodyside liner 12 and the outercover 14. Generally, the bodyside liner 12 and the outercover 14 are sealed to one another about their peripheries so as to encapsulate the absorbent core and thus make it possible to entrap and retain any fluids contained within the absorbent core. Generally, the bodyside liner will have a basis weight ranging between about 0.5 and about 0.85 ounce per square yard (17 grams per square meter and 28.8 grams per square meter).

The bodyside liner 12 of the present invention comprises a web of material which is made from a plurality of fibers which are woven or nonwoven. Fibrous nonwoven webs have traditionally been found to work particularly well as the web material for the present invention. Examples of such webs include, but are not limited to, spunbond webs, meltblown webs, bonded carded webs, air laid webs, wet laid webs, solution spun webs and generally any fibrous nonwoven web which has sufficient strength to be used as a liner for personal care absorbent articles.

The fibers themselves can be any type of fiber, such as short staple fibers or longer, more continuous fibers, as are found, for example, in meltblown and spunbond webs. The fibers can be natural or synthetic. Polyolefins, polyesters, cellulosics, polyacetates, and polyacrylate thermoplastics are some examples of polymers from which the fibers can be formed. In addition, it is possible to make fibers from homopolymers, copolymers, and blends of such polymers. It is

also possible to form fibrous webs from blends of both synthetic fibers and natural fibers. Furthermore, the fibers may be hydrophilic or hydrophobic by nature or they may be treated to be such.

The fibers may have a variety of cross-sectional constructions including, but not limited to, solid, hollow, round, or irregular shapes such as bilobal, trilobal, and "x-shaped." The fibers also may be multiconstituent or multicomponent fibers. For example, biconstituent and bicomponent fibers work particularly well for bonding the fibrous web together. This is because such fibers typically have a lower melting point component which is used for heat bonding and a higher melting component which adds strength and resiliency to the fibers. Generally, the fibers will have average diameters which will range between about 18 and 22 microns.

In order to provide sufficient in-use strength, the fibrous web will most typically require additional bonding. Fibrous woven webs oftentimes have sufficient strength due to the weaving pattern used to form the web. Nonwoven webs, on the other hand, even with carding, have a relatively random fiber pattern or orientation. Consequently, such webs may require additional levels of fiber entanglement or bonding, collectively referred to as "bonding." Examples of bonding methods or techniques include, but are not limited to, hydroentangling, needling, stitching, heat bonding, adhesive bonding, and ultrasonic bonding. When the fibers forming all or a portion of the web are thermoplastic in nature, heat and ultrasonic bonding have been found to work particularly well. When bicomponent fibers are being used and/or a more lofty web is desired, through-air bonding has been found to work well. In through-air bonding, the unbonded web is contacted by a hot air source such as by passing the web through a hot air oven. The temperature of the air and the contact time are adjusted such that fiber-to-fiber bonding is achieved via the lower melting point component of the bicomponent fiber. When higher strengths are required, point bonding works well. Point

bonding can be accomplished using, for example, ultrasonic bonding equipment or heated and patterned bonding rolls.

Once the web/liner has been formed, it is treated with a wetness indicator treatment which at least partially surrounds the exterior surfaces of the fibers to provide the web/liner with a wetness indicator. Conventional liner materials, such as surfactant-treated polypropylene nonwoven webs, take in fluids very quickly and rapidly transfer the fluids to the underlying absorbent core. As a result, within a very short time, the liner feels dry to the user. By using a wetness indicator treatment, the relative surface moisture can be maintained at a higher level for a longer period of time. This is accomplished by way of the present invention. As is shown by the test data below, when plotting relative wetness versus time, current surfactant-treated liners when wetted have an initial wetness, but this level of wetness drops off quickly with time. With the coating and liners of the present invention, higher wetness values are extended over a longer initial period of time while still having the liner ultimately return to an acceptable level of dryness within a reasonable period of time.

To accomplish the above-described effect, the fibers of the liner material are treated with a wetness indicator treatment comprising polyvinyl alcohol and a surfactant. Desirably, the coating is applied as an aqueous dispersion such that the treated portion of the liner has from about 1 to about 5 percent of the coating by weight, based upon the total weight of the treated portion of the liner. Such a polyvinyl alcohol coating material is available from Air Products and Chemicals, Inc. of Allentown, PA and is sold under the trademark of Airvol. Crosslinking agents may be incorporated into polyvinyl alcohol coatings but they are not essential. Suitable crosslinking agents are those known in the art, such as glyoxal, formaldehyde, urea-formaldehyde, melamine-formaldehyde, metal compounds, such as cupric ammonium complexes, organic titanates, and the like. When added, the crosslinking agents usually are employed in an

amount in the range of from about 1 to about 5 percent by weight, based on the weight of polyvinyl alcohol in the aqueous solution, although higher or lower amounts can be employed if desired.

Since flexibility of the liner often is a required characteristic, a plasticizer may be added to the polyvinyl alcohol coating solution. Suitable plasticiziers in general are any of the known plasticizers for polyvinyl alcohol, such as, for example, glycerol, ethylene glycol, polyethylene glycol, and the like.

Oftentimes, it is desirable to reduce article fluid leakage by adding a small amount of surfactant to the polyvinyl alcohol coating solution to enhance the fluid transport rate through the liner and the fluid absorbed by the absorbent core. The amount of surfactant is in the range of from 0.1 to 10 percent by weight, based on the weight of polyvinyl alcohol in the aqueous solution.

The outercover of the personal care absorbent article has the purpose of helping retain any exudated body fluids or other liquids within the absorbent core of the personal care absorbent article. Plastic films and/or nonwovens and/or film/nonwoven laminates can be used to form the outercover. Thermoplastic polymers including, but not limited to, polyolefins have been found to work particularly well as the forming material for both film and nonwoven outercovers. If desired, the outercover may be made breathable through the use of breathable plastic films and/or through the use of aperturing.

The absorbent core which is disposed between the bodyside liner and the outercover is used to absorb the main portion of the body fluids or other liquid delivered to it through the bodyside liner. Any of the available absorbent materials may be used to form the absorbent core. Examples of such materials include, but are not limited to, natural and synthetic wood pulp fluff fibers, hydrophilic thermoplastic fibers and superabsorbents.

Superabsorbents are water-swellable, water-soluble organic or inorganic materials capable, under the most favorable conditions, of absorbing at least about 20 times their weight and, more desirably, at least about 30 times their weight in an aqueous solution containing 0.9 weight percent sodium chloride. Organic materials suitable for use as superabsorbent materials in conjunction with the present invention can include natural materials such as agar, pectin, guar gum, and the like; as well as synthetic materials, such as synthetic hydrogel polymers. Such hydrogel polymers include, for example, alkali metal salts of polyacrylic acids, polyacrylamides, polyvinyl alcohol, ethylene maleic anhydride copolymers, polyvinyl ethers, methyl cellulose, carboxymethyl cellulose, hydroxypropylcellulose; and polymers and copolymers of vinyl sulfonic acid, polyacrylates, polyacrylamides, polyvinylpyrrolidone, and the like. Other suitable polymers include hydrolyzed acrylonitrile grafted starch, acrylic acid grafted starch, and isobutylene maleic anhydride polymers and mixtures thereof. The hydrogel polymers are preferably lightly crosslinked to render the materialS substantially water insoluble. Crosslinking may, for example, be accomplished by irradiation or by covalent, ionic, van der Waals, or hydrogen bonding. The superabsorbent materials may be in any form suitable for use in absorbent composites including particles, fibers, flakes, spheres, and the like. Such superabsorbents are usually available in particle sizes ranging from about 20 to about 1000 microns. The absorbent core 16 can contain from 0 to 100 percent superabsorbent by weight based upon the total weight of the absorbent core.

Depending upon the design of the particular personal care absorbent article, other components also may be included. For example, referring again to Figure 1, if the personal care absorbent article 10 is a training pant, it also may include elastic side panels 18. The article also may include (not shown) such things fluid containment flaps, fastening devices and other layers of liquid transfer or retention material.

See, for example, U.S. Patent No. 5,192,606 to Proxmire et al. which is incorporated herein by reference in its entirety.

Having thus described the invention in detail, several samples of the present invention were prepared and tested for their relative surface moisture values in accordance with the test procedure set forth below.

RELATIVE SURFACE MOISTURE TEST

The relative surface moisture in the liner and overall article was calculated from measurements made using a Surface Dryness Measuring Equipment apparatus manufactured by Hoechst Atkiengesellschaft of West Germany. A detailed description of this type of equipment and its operation can be found in U.S. Patent Number 4,924,084 to Lask et al. which is incorporated herein by reference in its entirety. The equipment for this apparatus included a strip chart recorder from the Linear Instrument Corporation of Reno, Nevada (Model 1201). The chart recorder recorded moisture readings from an optical light sensor which in turn was connected to a DC power source. Prior to the conductance of testing, the equipment was turned on and allowed to warm up for a minimum of 45 minutes.

To test each sample, each sample was placed on top of a 43.5 centimeter long by 9 centimeter wide plexiglass plate. The samples were generally the same size as the plexiglass plate. In order to normalize the moisture values for each sample, a dry reading and a wet reading were both obtained in addition to the actual wetness curve which was generated over a preselected time interval which in this case was 10 minutes.

To obtain a dry reading and thus a lower limit on the graph, the sensor was placed over the top of the sample with the longitudinal axis of the sensor being perpendicular to the longitudinal axis of the sample and with the ends of the optical light sensor extending equidistant over both side edges of the sample. The sample was positioned with the liner side adjacent the light sensor and the back sheet facing the

plexiglass support. The chart pen was then activated by switching the recorder from stand-by to record and the pen was then zeroed over the 20 grid mark location and the recorder was then returned to stand-by and the detector was removed from the sample.

Next a stainless steel ring having a 6 centimeter inner diameter, a height of 4 centimeters and a weight of approximately 326 grams was centered over the longitudinal and transverse center of the sample in the same location as the dry reading was taken. Into the center of the steel ring there was poured 80 milliliters of certified blood bank saline (Catalogue No. B3158-1) from the Baxter Healthcare Corporation, Scientific Products Division, McGaw Park, Illinois. The saline solution was a stabilized isotonic 0.9% saline solution containing no preservatives. The saline solution was at ambient temperature (72 to 74°F) (22 to 23°C). The 80 milliliters of saline solution was quickly poured into the ring and thus onto the liner side of the absorbent sample. Immediately after the saline solution was absorbed below the surface of the liner (no excess liquid standing on the liner), the stainless steel ring was removed and the optical light sensor was immediately placed on top of the sample in the same manner as described before and the chart recorder was switched from stand-by to record. The recorder was adjusted to a chart speed of 1 centimeter per minute and the test was allowed to run for a total of ten minutes. At the end of the ten minute interval, the chart pen was lifted and the chart was turned off by switching the chart to stand-by. Next, the ring was placed back on top of the sample in the same location as before and the sample was totally saturated by pouring an additional quantity of saline solution generally in an amount of about 100 milliliters so as to completely saturate the absorbent core. The amount of liquid in the pad after the second insult should be enough such that the weight of the sensor causes slight flow back of the liquid to the surface. The ring was then removed and the optical light sensor, whose optical sensing portion had been wiped free of any excess

saline solution from the previous measurement, was placed in the same location on top of the sample in the same manner as described above. The chart was again switched from stand-by to record and the chart was either momentarily activated or the chart paper was moved back and forth so as to achieve a mark or location on the grid paper representing the total saturation measurement for the sample. Having done this, each sample then has a zero or dry value (V_D), a total saturation value (V_S) and a time dependent curve extending from the point of absorption of the initial 80 milliliters of saline solution to a point ten minutes later.

Following the collection of this data, the relative surface moisture values were calculated using the following equation:

$$\text{relative surface moisture (\%)} = \frac{V_T - V_D}{V_S - V_D} \times 100 = V_R$$

where:

V_T is the value on the curve at a given time.

V_D is the value on the curve when the sample is dry. V_D equaled 20 for all examples tested.

V_S is the value on the curve when the sample is saturated.

EXAMPLES

To demonstrate the present invention, several samples were made and tested against a currently available Kimberly-Clark Huggies® Pull-ups® training pant (size 2) and a Procter and Gamble Pampers® Trainers® training pant for relative surface moisture at 48 seconds and ten minutes using the test outlined above.

The Pampers® Trainers® training pant had a bodyside liner believed to contain rayon staple fibers, an absorbent core

which contained superabsorbent, an outercover and elastic side panels.

The currently available Kimberly-Clark Huggies® Pull-Ups® training pant had an outercover including an interior layer of 0.7 mil (18 microns) thick polypropylene film adhesively laminated to an exterior layer of 0.8 ounce per square yard (27 grams per square meter (gsm)) polypropylene spunbond web. The bodyside liner was a 0.75 ounce per square yard (25.4 gsm) polypropylene spunbond web having an average fiber size of three denier (22 microns).

The bodyside liner of the Huggies® Pull-ups® training pant was treated with 0.3 percent by weight, based upon the total weight of the liner, Triton X-102 surfactant. The surfactant treatment at least partially coated the spunbond fibers. Triton X-102 surfactant is an octylphenoxypolyethoxyethanol nonionic surfactant which is available from the Union Carbide Chemicals and Plastics Company, Inc. of Danbury, Connecticut. The absorbent core for the training pant had a total weight of 28 grams (one ounce) with 16 grams (0.56 ounces) of Kimberly-Clark CR-254 wood pulp fluff and 12 grams (0.42 ounces) of SAB 836 cross-linked polyacrylate particulate superabsorbent from Stockhausen of Greensboro, North Carolina. The wood pulp fluff and superabsorbent particles were mixed together to form the absorbent core and the core was wrapped with a 9.79 pound per ream (21.5 kilograms per ream) non-optically brightened, wet strength tissue wrap sheet. The training pant also contained elastic side panels, inboard containment flaps and an elastic waist. The top sheet or bodyside liner was attached to the wrap sheet of the absorbent core using spray adhesive. Such training pants are further explained in U.S. Patent No. 4,940,464 to Van Gompel et al. which is incorporated herein by reference in its entirety.

The samples according to the present invention included an absorbent core made from a blend of 18 grams of Kimberly-Clark CR-254 wood pulp fluff and 9 grams of the same SAB 836 superabsorbent. The absorbent core had a length of

40.5 centimeters and a width of 9.3 centimeters. It was wrapped with the same 9.79 pound per ream tissue wrap sheet mentioned above. One of the samples also included a one mil polyethylene film positioned adjacent the bottom surface of the absorbent core. No appreciable difference was seen in the relative surface moisture readings for the samples with and without the polyethylene film due to the plexiglass backing plate restricting fluid flow. The values in Table I were for the construction without the film.

The bodyside liner of the present invention was a 0.8 ounce per square yard (27.1 gsm), 3 denier (22 micron) polypropylene spunbond nonwoven web treated with an aqueous solution containing 1% Airvol 203 low molecular weight, partially hydrolyzed polyvinyl alcohol and 0.05% Triton X-102 surfactant. Four different liner samples were treated with four different solid add-on level ranges of the polyvinyl alcohol and Triton surfactant. The aqueous solution was applied using a dip and squeeze application. Once the solution had been applied, the treated liner material was allowed to air dry at room temperature overnight. The first sample liner material according to the present invention had a dry add-on, based upon the total weight of the treated liner, of 1 percent polyvinyl alcohol and 0.05 percent surfactant. The second sample liner had an add-on of 2.0 percent polyvinyl alcohol and 0.10 percent surfactant. The third sample liner according to the present invention had an add-on of 3.0 percent polyvinyl alcohol and 0.15 percent surfactant and the fourth sample had a dry add-on of 4 percent polyvinyl alcohol and 0.20 percent surfactant.

The four liner materials (4%, 3%, 2% and 1%) each having dimensions of 35.6 centimeters (length) by 17.8 centimeters (width) were placed on top of the absorbent core, wrapped completely around it and taped closed on the back side of the absorbent core using adhesive tape. Thus, this material functioned as both the bodyside liner and the outercover. No additional outercover was required as the plexiglass plate restricted fluid flow.

The two commercial sample training pants were tested with the side panels removed and the elastics cut to permit the articles to lay as flat as possible for testing. The samples according to the present invention were tested with the taped side adjacent the plexiglass plate. Each of the samples were separately insulted with 80 milliliters of room temperature (72 to 74°F) (22 to 23°C) 0.9 percent saline solution and tested in accordance with the relative surface moisture test procedure and equipment described above. The raw data is presented in Table I below. The relative surface moisture values (Table II) were calculated from the raw values on the chart recorder set forth in Table I.

Figure 2 shows a plot of the relative surface moisture data from Table II as a function of time. The data points and curve for the relative surface moisture values for the current Kimberly-Clark Huggies® Pull-Ups® training pant ("K-C Pant") were plotted using "cross signs" ("X") while the data points and curve for the Procter and Gamble training pant ("Pant 1") were plotted using upside down triangles ("▽"). The data points for the curves representing the present invention were plotted using "plus signs" ("+"), "squares" ("□"), "diamonds" ("◇") and "triangles" ("△") for polyvinyl alcohol add-on levels of 4%, 3%, 2% and 1%, respectively. Values were plotted over a period of ten minutes using values calculated at twelve second intervals.

TABLE I

RAW SURFACE MOISTURE DATA

Minutes	4% PVOH	3% PVOH	2% PVOH	1% PVOH	K-C PANT	Pant I
0.0	66.0	64.5	63.5	66.0	80.0	81.5
0.2	66.0	64.5	63.0	66.0	80.5	81.5
0.4	65.5	64.5	62.0	65.5	73.0	81.5
0.6	65.0	64.0	58.0	64.0	60.0	81.5
0.8	64.5	61.0	49.0	55.0	55.0	81.0
1.0	63.0	54.0	44.5	47.0	52.0	81.0
1.2	61.0	50.0	42.0	45.0	50.5	80.5
1.4	58.0	47.0	40.0	43.0	49.0	78.0
1.6	57.5	45.0	39.0	42.0	47.5	76.0
1.8	54.5	44.0	38.0	40.5	46.5	74.0
2.0	52.5	43.0	37.0	39.5	46.0	73.0
2.2	50.5	42.5	36.0	38.5	45.0	71.0
2.4	50.0	42.0	35.5	38.0	44.5	70.5
2.6	49.0	41.0	35.0	37.5	44.0	70.0
2.8	48.0	40.0	34.5	37.0	43.5	70.0
3.0	47.5	40.0	34.0	36.5	43.5	69.5
3.2	46.5	39.5	34.0	36.0	43.0	69.0
3.4	46.0	39.0	33.5	36.0	43.0	68.5
3.6	46.0	38.5	33.5	35.5	43.0	68.0
3.8	45.5	38.5	33.0	35.5	42.5	67.5
4.0	45.0	38.0	33.0	35.0	42.5	67.5
4.2	45.0	38.0	33.0	35.0	42.5	67.0
4.4	44.5	38.0	33.0	35.0	42.0	67.0
4.6	44.0	37.5	33.0	34.5	42.0	66.5
4.8	44.0	37.5	32.5	34.5	42.0	66.5
5.0	43.5	37.5	32.5	34.0	42.0	66.0
5.2	43.0	37.0	32.5	34.0	42.0	67.6
5.4	43.0	37.0	32.0	34.0	42.0	67.6
5.6	43.0	37.0	32.0	33.5	41.5	67.6

TABLE I

RAW SURFACE MOISTURE DATA

Minutes	4% PVOH	3% PVOH	2% PVOH	1% PVOH	K-C PANT	Pant I
5.8	42.5	37.0	32.0	33.5	41.5	66.9
6.0	42.5	37.0	32.0	33.5	41.5	66.9
6.2	42.5	36.5	32.0	33.5	41.5	66.9
6.4	42.5	36.5	32.0	33.5	41.5	66.2
6.6	42.5	36.0	31.5	33.5	41.0	66.2
6.8	42.5	36.0	31.5	33.5	41.0	66.2
7.0	42.0	37.0	31.5	33.5	41.0	66.2
7.2	42.0	37.0	31.5	33.5	41.0	65.4
7.4	42.0	37.0	31.5	33.0	41.0	65.4
7.6	42.0	37.0	31.5	33.0	41.5	64.7
7.8	42.0	37.0	31.5	33.0	41.5	64.7
8.0	42.0	37.0	31.5	33.0	41.5	64.0
8.2	41.5	37.0	31.5	33.0	41.5	64.0
8.4	41.5	37.0	31.0	33.0	41.5	63.2
8.6	41.5	37.0	31.0	33.0	41.5	63.2
8.8	41.0	37.0	31.0	33.0	41.5	63.2
9.0	41.0	36.5	31.0	33.0	41.5	63.2
9.2	41.0	36.5	31.0	33.0	41.5	63.2
9.4	40.5	36.5	31.0	33.0	41.5	62.5
9.6	40.5	36.5	31.0	33.0	41.5	62.5
9.8	40.0	36.5	31.0	33.0	41.5	62.5
10.0	40.0	36.0	31.0	33.0	41.5	62.5
Saturated Value	66.0	65.0	63.5	66.0	83.5	88.0

TABLE II

NORMALIZED SURFACE MOISTURE DATA

Minutes	4% PVOH	3% PVOH	2% PVOH	1% PVOH	K-C PANT	Pant I
0.0	100.0	98.9	100.0	100.0	93.7	90.8
0.2	100.0	98.9	98.9	100.0	94.1	91.2
0.4	98.9	98.9	96.6	98.9	81.9	91.2
0.6	97.8	97.8	87.4	95.7	63.0	91.2
0.8	96.7	91.1	66.7	76.1	54.3	90.4
1.0	93.5	75.6	56.3	58.7	49.6	90.4
1.2	89.1	66.7	50.6	54.3	46.9	89.3
1.4	82.6	60.0	46.0	50.0	44.5	86.8
1.6	81.5	55.6	43.7	47.8	42.5	83.8
1.8	75.0	53.3	41.4	44.6	40.6	81.6
2.0	70.7	51.1	39.1	42.4	39.8	80.5
2.2	66.3	50.0	36.8	40.2	38.2	78.7
2.4	65.2	48.9	35.6	39.1	37.4	77.6
2.6	63.0	46.7	34.5	38.0	36.6	76.8
2.8	60.9	44.4	33.3	37.0	36.2	76.5
3.0	59.8	44.4	32.2	35.9	36.2	75.7
3.2	57.6	43.3	32.2	34.8	35.4	75.0
3.4	56.5	42.2	31.0	34.8	35.4	74.3
3.6	56.5	41.1	31.0	33.7	35.0	73.5
3.8	55.4	41.1	29.9	33.7	34.6	72.8
4.0	54.3	40.0	29.9	32.6	34.6	72.8
4.2	54.3	40.0	29.9	32.6	34.3	72.1
4.4	53.3	40.0	29.9	32.6	33.9	72.1
4.6	52.2	38.9	29.9	31.5	33.9	71.3
4.8	52.2	38.9	28.7	31.5	33.9	71.0
5.0	51.1	38.9	28.7	30.4	33.5	70.6
5.2	50.0	37.8	28.7	30.4	33.5	70.6

TABLE II

NORMALIZED SURFACE MOISTURE DATA

Minutes	4% PVOH	3% PVOH	2% PVOH	1% PVOH	K-C PANT	Pant I
5.4	50.0	37.8	27.6	30.4	33.5	70.6
5.6	50.0	37.8	27.6	29.3	33.1	70.2
5.8	48.9	37.8	27.6	29.3	33.1	69.9
6.0	48.9	37.8	27.6	29.3	33.1	69.9
6.2	48.9	36.7	27.6	29.3	33.1	69.9
6.4	48.9	36.7	27.6	29.3	33.1	69.1
6.6	48.9	35.6	26.4	29.3	32.7	69.1
6.8	48.9	35.6	26.4	29.3	32.7	69.1
7.0	47.8	37.8	26.4	29.3	32.7	69.1
7.2	47.8	37.8	26.4	29.3	32.7	68.8
7.4	47.8	37.8	26.4	28.3	32.7	68.4
7.6	47.8	37.8	26.4	28.3	33.1	68.0
7.8	47.8	37.8	26.4	28.3	33.1	68.0
8.0	47.8	37.8	26.4	28.3	33.5	67.6
8.2	46.7	37.8	26.4	28.3	33.5	67.3
8.4	46.7	37.8	25.3	28.3	33.5	66.9
8.6	46.7	37.8	25.3	28.3	33.5	66.9
8.8	45.7	37.8	25.3	28.3	33.5	66.9
9.0	45.7	36.7	25.3	28.3	33.5	66.5
9.2	45.7	36.7	25.3	28.3	33.5	66.5
9.4	44.6	36.7	25.3	28.3	33.5	65.8
9.6	44.6	36.7	25.3	28.3	33.5	65.8
9.8	43.5	36.7	25.3	28.3	33.5	65.8
10.0	43.5	35.6	25.3	28.3	33.5	65.8

Turning to the graphs in Figure 2, it can be seen that Pant 1 had an approximate 90 percent initial relative surface moisture. This value then dropped to approximately 75 percent at three minutes. Within the next seven minutes the percent moisture began to flatten out to a value of approximately 65 percent at the end of ten minutes. Thus this article started out wet and continued to stay wet. In contrast, the currently available Kimberly-Clark Huggies® Pull-ups® training pants started off very wet at almost 94 percent relative surface moisture but then dropped off to a value of 54 percent by the end of 48 seconds. By ten minutes the relative surface moisture had dropped to a low of 33.5 percent. Thus, this training pant dried out more quickly after being insulted with the saline solution.

The present invention showed a balance between the other two articles. As can be seen from the graphs in Figure 2, the curve for the 4 percent polyvinyl alcohol treated liner started off very wet (100%) and maintained a high wetness for quite sometime. At 48 seconds the relative surface moisture value reading was 96.7 percent and it was not until more than 5 minutes that this liner had a relative surface moisture value reading that was approximately the same as the current K-C Pant at one minute. The final value at ten minutes was 43.5 percent relative surface moisture. The 3 percent polyvinyl alcohol treated liner also started off very wet (98.9%) and at 48 seconds still had a relative surface moisture value of 91.1 percent. After 48 seconds, the 3% liner dropped off relatively quickly and at ten minutes had a relative surface moisture value of 35.6% which was slightly more than half the value for Pant 1 at the same time. The 2 percent polyvinyl alcohol treated liner also started off extremely wet (100.0%). At 48 seconds the relative surface moisture value was 66.7 percent and at the end of ten minutes the value was 25.3 percent which was even lower than the K-C Pant (33.5%). The 1 percent polyvinyl alcohol treated liner was comparable to the 2 percent liner in that it started off

very wet (100.0%) and then dropped to a value of 76.1 percent at 48 seconds and 28.3 percent at ten minutes.

Thus, it can be seen that the present invention can be used to provide a personal care absorbent article which maintains a high relative surface wetness for at least 48 seconds and then, within a very short period of time, approximately ten minutes, has a relative surface moisture value that drops to approximately 45 percent or less thus creating an article which has a dry feel that is more comfortable to wear until such time as it is possible or convenient to change the soiled article. Consequently, the present invention has practical application with respect to all types of personal care absorbent articles.

Having thus described the invention in detail, it should be apparent that various modifications and changes can be made in the present invention without departure from the spirit and scope of the following claims.

CLAIMS:

1. A personal care absorbent article comprising:

a liquid permeable bodyside liner, an outercover and an absorbent core disposed between said bodyside liner and said outercover to form said article,

said article having a relative surface moisture value of 65 percent or greater at approximately 48 seconds and a relative surface moisture value of 45 percent or less at approximately ten minutes.

2. The personal care absorbent article of claim 1 wherein said bodyside liner comprises a nonwoven web having a plurality of fibers, said web including a wetness indicator treatment.

3. The personal care absorbent article of claim 2 wherein said article has a relative surface moisture value of 90 percent or greater at approximately 48 seconds.

4. The personal care absorbent article of claim 2 wherein said wetness indicator treatment comprises polyvinyl alcohol.

5. The personal care absorbent article of claim 4 wherein said wetness indicator treatment further comprises a surfactant.

6. The personal care absorbent article of claim 5 wherein said surfactant is an octylphenoxypolyethoxyethanol surfactant.

7. The personal care absorbent article of claim 6 wherein said wetness indicator treatment is present on said web in an add-on of from about one to about five percent by weight based upon the total weight of said web.

8. The personal care absorbent article of claim 1 wherein said article is in the form of a training pant.

9. The personal care absorbent article of claim 1 wherein said article is in the form of a diaper.

10. The personal care absorbent article of claim 1 wherein said article is in the form of an incontinence garment.

11. A personal care absorbent article comprising:

a liquid permeable bodyside liner, an outercover and an absorbent core disposed between said bodyside liner and said outercover to form said article,

said bodyside liner comprising a nonwoven web having a plurality of fibers and a wetness indicator treatment,

said wetness indicator treatment comprising polyvinyl alcohol and an octylphenoxyethoxyethanol surfactant in an add-on of from about one to about five percent by weight based upon the total weight of said web,

said article having a relative surface moisture value of 65 percent or greater at approximately 48 seconds and a relative surface moisture value of 45 percent or less at approximately ten minutes.

12. The personal care absorbent article of claim 11 wherein said article is in the form of a training pant.

13. The personal care absorbent article of claim 11 wherein said article is in the form of a diaper.

14. The personal care absorbent article of claim 11 wherein said article is in the form of an incontinence garment.

15. A bodyside liner material for a personal care absorbent article comprising a nonwoven web having a plurality

of fibers, said web including a wetness indicator treatment covering said plurality of fibers in an add-on from about one to about five percent by weight based upon the total weight of said web, said wetness indicator treatment comprising polyvinyl alcohol and a surfactant.

16. The bodyside liner material of claim 15 wherein said surfactant is an octylphenoxypolyethoxyethanol surfactant.

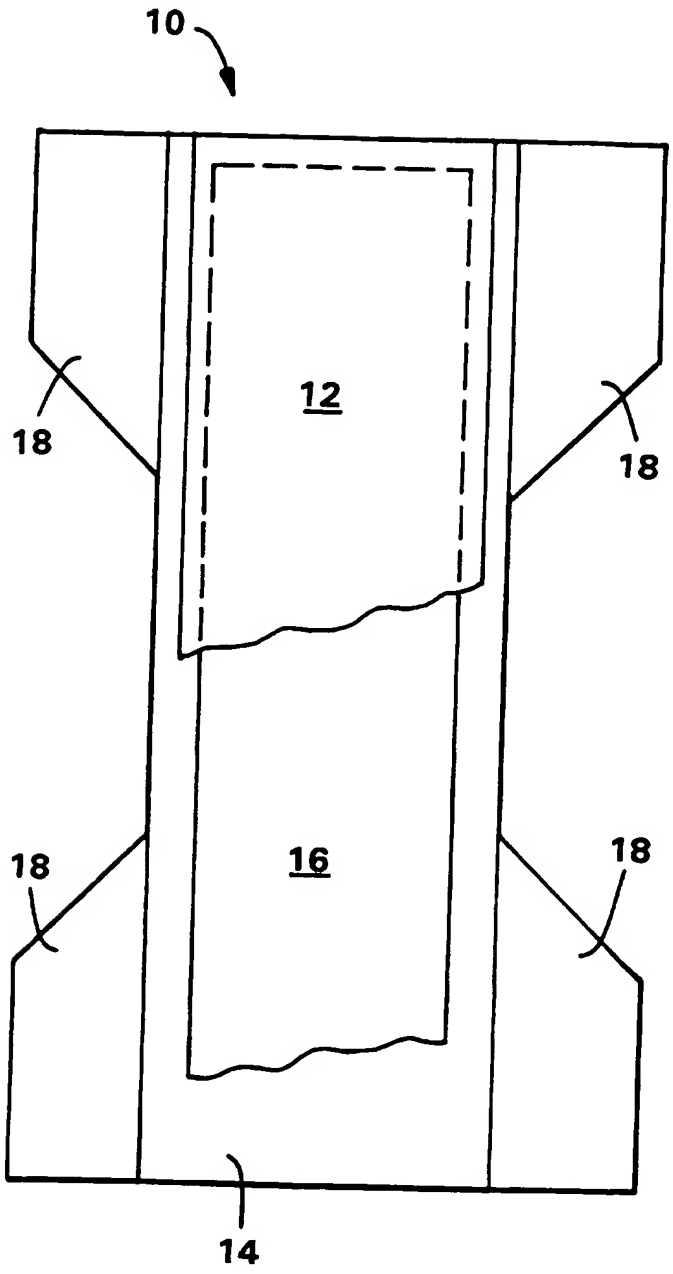

FIG. 1

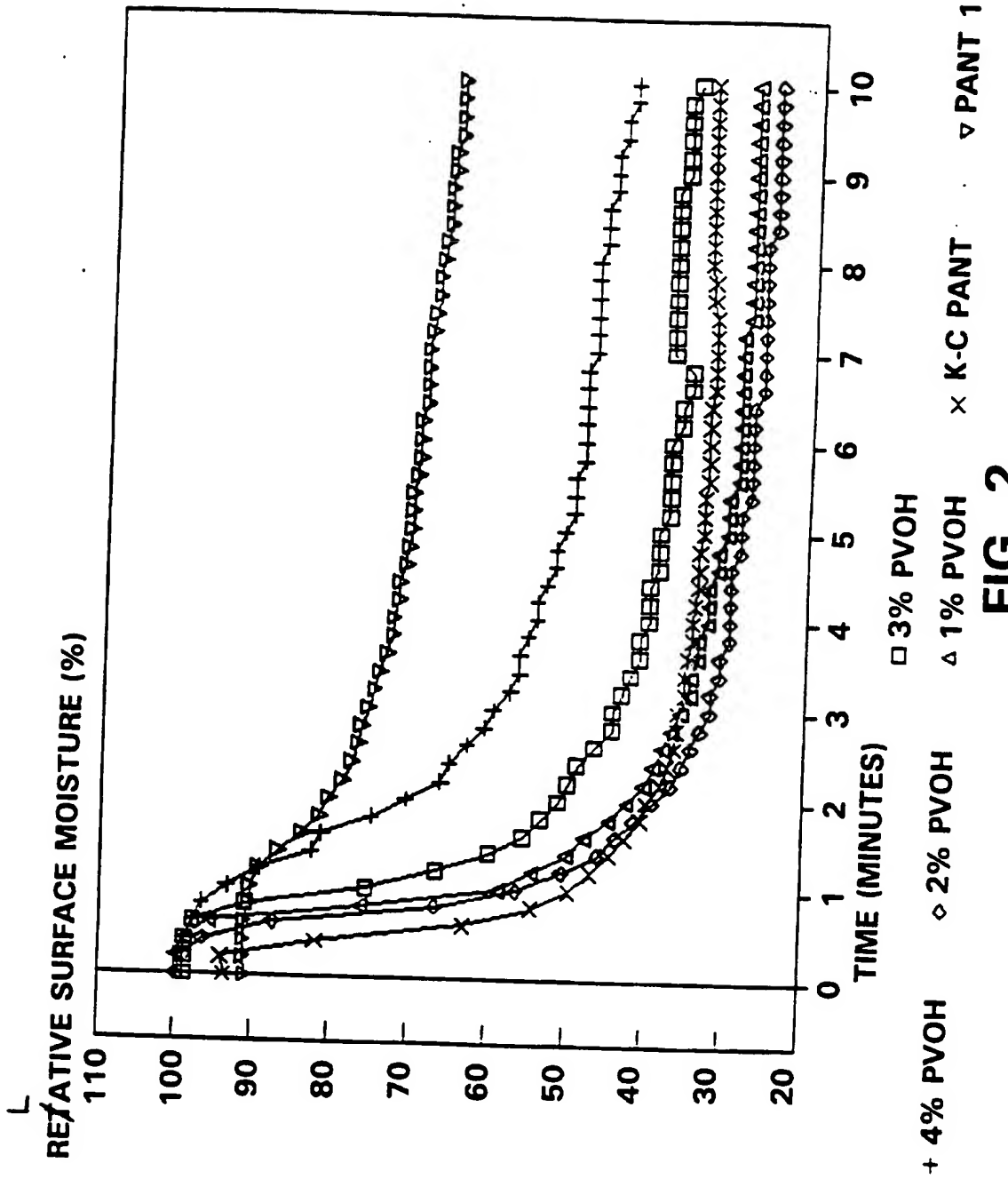
RELATIVE SURFACE MOISTURE (%)
110
100
90
80
70
60
50
40
30
20
0
1
2
3
4
5
6
7
8
9
10
TIME (MINUTES)
+ 4% PVOH
◇ 2% PVOH
□ 3% PVOH
△ 1% PVOH
× K-C PANT
▽ PANT 1

FIG. 2

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 95/10211

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61F13/15

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP,A,0 529 641 (UNI-CHARM CORPORATION) 3 March 1993 see the whole document ---	1-3,5, 8-14
A	EP,A,0 454 105 (UNI-CHARM CORPORATION) 30 October 1991 see the whole document ---	1-3,5, 8-14
A	US,A,5 062 839 (ANDERSON) 5 November 1991 see the whole document ---	1,2,8-12
A	EP,A,0 304 952 (PERSONAL PRODUCTS COMPANY) 1 March 1989 see claims ---	4
A	GB,A,2 237 205 (SHIPLEY) 1 May 1991 see page 3, paragraph 3 - last paragraph; claims ---	6

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
16 February 1996	01.03.96
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	**Authorized officer** Douskas, K

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INTERNATIONAL SEARCH REPORT

Inter. nal Application No
PCT/US 95/10211

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/US 95/10211

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